



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

# Memorandum

Subject: Action: Review and Concurrence, Equivalent Level of  
Safety Finding for the Seven Q Seven, Inc. Re-engine  
Modification to a Boeing Model 707-300B/C  
FAA Project Number ST7065SE-T

Date: 8/9/04

Reg Ref: § 25.1203(a)

From: Manager, Propulsion/Mechanical Systems Branch,  
ANM-111

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To: Manager, Los Angeles Aircraft Certification Office,  
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ELOS Memo #: ST7065LA-T-P-1

## **Background**

Title 14 Code of Federal Regulations part 25, § 25.1203(a) requires fire detection within turbine engine tailpipe sections. Seven Q Seven, Inc. (SQS) plans to modify Boeing Model 707-300B/C series airplanes by installing thrust reversers that are hydraulically operated and electrically controlled. The thrust reverser assembly also acts as a tailpipe for the Pratt & Whitney (P&W) JT8D-219 engines. This proposed engine installation does not incorporate fire protection within the tailpipe.

## **Applicable regulation(s)**

§§ 25.1203(a), 25.1181(a)(7), 25.1187, 25.1193(e)(1)

## **Regulation(s) requiring an ELOS**

§ 25.1203(a)

## **Description of compensating design features or alternative standards which allow the granting of the ELOS (including design changes, limitations or equipment need for equivalency)**

The engine tailpipe configuration must either comply with § 25.1203(a) by incorporating fire detection within the tailpipe zone or compensating design features should be presented and analyzed to support a finding of equivalent safety under the provisions of § 21.21(b)(1). In general, the applicant should list and analyze the compensating design features which would minimize the number of potential ignition sources and limit the amount of flammable fluid (hydraulic) which could leak into the tailpipe section. The applicant should address the following issues:

### 1. Hydraulic Fluid Flammability and Exhaust Pipe Temperatures

The minimum flash point, fire point, and auto ignition temperature of the hydraulic fluid should be specified. The auto ignition temperature of the hydraulic fluid should be compared to maximum exhaust pipe temperature which were measured during thrust reverser testing and then extrapolated to the worst case "hot day" maximum temperature. The exhaust pipe surface (within this tailpipe zone) should not be an ignition source for the hydraulic fluid.

### 2. Electrical Wires and Components

The heat rating for the thrust reverser wiring should be given and credit should be given for any additional wire sleeving which would further minimize the probability of contact between wiring and combustible fluids. In addition, when the thrust reverser is not operating (normal inflight configuration), electrical current should not be running through the wires and switches within this zone. If an electrical short should occur, maximum current flow should be limited by a low amperage breaker (i.e. three amps) for this micro switch circuit(s).

### 3. Thrust Reverser Hydraulic Fluid Leakage

SQS should identify the maximum amount of hydraulic fluid that can leak into the tailpipe zone inflight. Credit should be given for thrust reverser hydraulic isolation valves that would limit the hydraulic fluid leakage into the tailpipe zone.

### 4. Flammable Fluid Drainage

The tailpipe sections should be in compliance with the drainage and ventilation provisions of § 25.1187.

### 5. Firewall Containment and Isolation

Firewalls should be provided in the aft cowl and pylon sections (not around the tailpipe/thrust reverser zone) in order to isolate a fire within the tailpipe fire zone from the fuselage, pylon, and remainder of the engine nacelle. These firewalls are required for compliance with § 25.1193(e)(1).

### 6. Service Experience of Similar Designs

If available, a brief summary of service experience number (hours/cycles and the number of incidents or Airworthiness Directives) with similar/identical thrust reverser designs can also be used as substantiating data.

SQS must address the issues outlined above to demonstrate that compensating design features provide an equivalent level of safety to the provisions of § 25.1203(a).

**Explanation of how design features or alternative standards provide an equivalent level of safety to the level of safety intended by the regulation**

Compliance with the criteria stated above will minimize the potential for a fire in the tailpipe of the engine to such an extent that fire detection is unnecessary. The resulting configuration will be equivalently safe to the level of safety intended by the regulation.

**FAA approval and documentation of the ELOS**

The FAA has approved the aforementioned Equivalent Level of Safety Finding in issue paper P-1. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number should be listed in the Type Certificate Data Sheet under the Certification Basis section (TC's & ATC's) or on page 3 of the STC Certificate.

[E.g. Equivalent Safety Findings have been made for the following regulations:

§25.103 Stalling Speed (documented in TAD ELOS Memo SA5884SE-T-F-1)

§25.207 Stall Warning (documented in TAD ELOS Memo SA5884SE-T-F-1)]

Original signed by Neil P. Schalekamp

Manager, Propulsion/Mechanical Systems Branch, ANM-112

8/9/04

Date

ELOS Originated by Los Angeles ACO:	Project Engineer William Bond	Routing Symbol ANM-140L
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